The discipline of geography contributes to an understanding of society by exploring the Earth’s environment and its interactions with human life, by inquiring into cultures and societies from the perspective of area study, and by investigating problems of spatial organization. The BA program in geographical sciences offers a distinctive focus for general education and provides a background both for advanced specialization in the discipline and for study in other fields. Solid grounding in modern geography can lead to careers in government service, environmental consulting, marketing, publishing, planning, and teaching at all levels.

Program Requirements
The BA degree in geographical sciences calls for the satisfactory completion of eleven courses, at least eight of which must be in geographical sciences. These include an introduction to Geographic Information Systems/GIS (GEOG 28202 Geographic Information Science I); the senior seminar (GEOG 29800 Senior Seminar); and at least nine additional geography courses, up to three of which may be in approved related fields. A BA thesis is prepared in connection with the senior seminar.

Summary of Requirements: BA in Geographical Sciences

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 28202</td>
<td>Geographic Information Science I</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Nine additional geographical sciences courses; up to three may be in approved related fields</td>
<td>900</td>
</tr>
<tr>
<td>GEOG 29800</td>
<td>Senior Seminar</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>BA thesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Units</strong></td>
<td><strong>1100</strong></td>
</tr>
</tbody>
</table>

Grading
All courses counted toward the geographical sciences major must be taken for quality grades.

Research Grants
Geographical sciences students may apply for small grants from the Ada Espenshade Wrigley Fund in support of extraordinary expenses connected with research leading to their BA thesis.

Honors
Honors are awarded to students with an overall GPA of 3.0 or higher who submit a BA thesis that is judged to be outstanding.

Awards
Each year the Committee on Geographical Sciences nominates fourth-year students for an Outstanding Senior in Geography Award from the Illinois Geographical Society and an Award for Excellence from the National Council for Geographic Education and the Association of American Geographers.

Minor in Geographic Information Science
Spatial thinking deals with the fundamental role of space, place, location, distance, and interaction—crucial to tackling many research questions in the social and physical sciences. The minor in geographic information science provides a coherent exposure to rigorous spatial thinking and its expression through the theories and methods of geographic information science.

Geographic information science covers all aspects pertaining to accessing, storing, transforming, manipulating, visualizing, exploring, and reasoning about information where the locational component is important (spatial data). This includes the technical and computational aspects of geographic information systems, the methodologies of spatial analysis and spatial statistics, mapping, and geo-visualization, as well as societal aspects related to the use of geographic data.

The minor serves as a complement to other majors, such as computer science, statistics, economics, public policy studies, sociology, anthropology, political science, or environmental and urban studies, but would also be of value to majors in the humanities and physical sciences interested in the spatial aspects of their field.

The courses in the minor are open to geographical sciences majors, but the minor cannot be taken concurrently with a geographical sciences major.

Program Requirements for the Minor
The minor consists of six core courses and one elective from a series of offerings. The core courses provide a coherent exposure to rigorous spatial thinking and its incorporation into the methodologies of geographic information systems, spatial analysis, and spatial data science.
The electives consist of courses that touch upon various aspects of spatial thinking, with different degrees of technical materials, and are intended to either act as “gateways” into the minor or to provide the opportunity for the application of spatial analysis in a range of fields.

The sequencing of courses is designed such that students can complete all requirements for the minor in one year of study (provided the statistics prerequisite has been taken prior).

The capstone course for the minor is GEOG 28000 GIScience Practicum, which may be taken concurrently with GEOG 28602 Geographic Information Science III. Students will develop a multifaceted GIS project incorporating spatial thinking in design, infrastructure, and implementation. Projects could include the development of a web application, dynamic dashboard, interactive storytelling map, infographic-driven policy brief, or research article, and can be carried out in conjunction with a thesis requirement of the student’s major.

Summary of Requirements: Minor in Geographic Information Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 28202</td>
<td>Geographic Information Science I</td>
<td>100</td>
</tr>
<tr>
<td>GEOG 28402</td>
<td>Geographic Information Science II</td>
<td>100</td>
</tr>
<tr>
<td>GEOG 28602</td>
<td>Geographic Information Science III</td>
<td>100</td>
</tr>
<tr>
<td>GEOG 28000</td>
<td>GIScience Practicum</td>
<td>100</td>
</tr>
<tr>
<td>GEOG 20500</td>
<td>Introduction to Spatial Data Science</td>
<td>100</td>
</tr>
<tr>
<td>STAT 22000</td>
<td>Statistical Methods and Applications (or equivalent)</td>
<td>100</td>
</tr>
<tr>
<td>Any elective from the list of courses below</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Total Units</td>
<td></td>
<td>700</td>
</tr>
</tbody>
</table>

Note: Many GEOG courses are also cross-listed with SOCI and ENST.

* Students who take STAT 22000 to satisfy a requirement in a major will complete a six course minor.
Students who take STAT 22000 to satisfy only the GIS minor will complete a seven course minor.

Elective Options for the Minor in Geographic Information Science

One of the following courses may be taken to fulfill the elective course option for the minor in geographic information science.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 20273</td>
<td>Urban Spatial Archaeology I</td>
</tr>
<tr>
<td>GEOG 24600</td>
<td>Introduction to Urban Sciences</td>
</tr>
<tr>
<td>GEOG 24700</td>
<td>Introduction to Urban Planning</td>
</tr>
<tr>
<td>GEOG 25900</td>
<td>Introduction to Location Analysis</td>
</tr>
<tr>
<td>GEOG 27155</td>
<td>Urban Design with Nature</td>
</tr>
<tr>
<td>GEOG 28700</td>
<td>Readings in Spatial Analysis</td>
</tr>
<tr>
<td>GEOG 28702</td>
<td>Introduction to GIS and Spatial Analysis</td>
</tr>
<tr>
<td>GEOG 28800</td>
<td>History of Cartography</td>
</tr>
<tr>
<td>GEOG 28900</td>
<td>Readings in Urban Planning and Design</td>
</tr>
</tbody>
</table>

Note: many GEOG courses are also cross-listed with SOCI and ENST.

Advising and Grading

Courses in the minor may not be double counted with the student’s major(s), other minors, or general education requirements. For students who have taken STAT 22000 (or equivalent) as a requirement for another major, minor, or general education requirement, an approved elective must replace that requirement.

Courses in the minor must be taken for quality grades, and more than half of the requirements for the minor must be met by registering for courses bearing University of Chicago course numbers.

The courses in the minor are open to geographical sciences majors, but the minor cannot be taken concurrently with a geographical sciences major.

Students who elect the minor must meet with the program director before the end of Spring Quarter of their third year to declare their intention to complete the minor. The director’s approval for the minor program should be submitted to a student’s College adviser by the deadline above using a form available from the adviser.

Students may petition the program director to have a course counted as an elective that is not included on the current list of electives.

GEOPHICAL SCIENCES COURSES

The following courses are for reference only. See Class Search at registrar.uchicago.edu/classes for specific offerings. See the Geography webpage at geography.uchicago.edu for further information on quarterly offerings.
GEOG 20273. Urban Spatial Archaeology I. 100 Units.
Space and time are fundamental concepts in urban spatial science. In this course, students will gain substantive and technical knowledge on how to analyze space and time through the tools of urban spatial archaeology. Specifically, this course will introduce students to various historical data sources on Chicago and New Orleans to digitize, then conduct a spatial historical analysis of any topic of their choice. By taking a historical approach to the study of time and space, students will walk away from the course with (1) ways to conceptualize time and space when studying urban issues, and (2) skills for designing a project to empirically demonstrate the workings of time and space in the real world. At the end of this course, students will be expected to have produced a historical dataset for a research paper that will be completed in the next course sequence.
Instructor(s): R. Vargas Terms Offered: Winter
Prerequisite(s): GEOG 30500 and GEOG 38201
Equivalent Course(s): SOCI 20273, GEOG 30273, SOCI 30273

GEOG 23500. Urban Geography. 100 Units.
This course examines the spatial organization and current restructuring of modern cities in light of the economic, social, cultural, and political forces that shape them. It explores the systemic interactions between social process and physical system. We cover basic concepts of urbanism and urbanization, systems of cities urban growth, migration, centralization and decentralization, land-use dynamics, physical geography, urban morphology, and planning. Field trip in Chicago region required. This course is part of the College Course Cluster, Urban Design.
Instructor(s): M. Conzen Terms Offered: Winter
Note(s): This course offered in even years.
Equivalent Course(s): ARCH 24660, ENST 24660, GEOG 33500

GEOG 24600. Introduction to Urban Sciences. 100 Units.
This course is a grand tour of conceptual frameworks, general phenomena, emerging data and policy applications that define a growing scientific integrated understanding of cities and urbanization. It starts with a general outlook of current worldwide explosive urbanization and associated changes in social, economic and environmental indicators. It then introduces a number of historical models, from sociology, economics and geography that have been proposed to understand how cities operate. We will discuss how these and other facets of cities can be integrated as dynamical complex systems and derive their general characteristics as social networks embedded in structured physical spaces. Resulting general properties of cities will be illustrated in different geographic and historical contexts, including an understanding of urban resource flows, emergent institutions and the division of labor and knowledge as drivers of innovation and economic growth. The second part of the course will deal with issues of inequality, heterogeneity and (sustainable) growth in cities. We will explore how these features of cities present different realities and opportunities to different individuals and how these appear as spatially concentrated (dis)advantage that shape people’s life courses. We will show how issues of inequality also have consequences at more macroscopic levels and derive the general features of population and economic growth for systems of cities and nations.
Instructor(s): Luis Bettencourt Terms Offered: Autumn
Prerequisite(s): STAT 22000
Equivalent Course(s): GEOG 34600, SOCI 20285, ENST 24600, PBPL 24605

GEOG 25900. Introduction to Location Analysis. 100 Units.
Understanding the location of business activities - agricultural, industrial, retail, and knowledge-based - has long been a focus for economic geographers, regional scientists, and urban planners. This course traces the key theories and conceptual models that have been developed over time to explain why economic activities tend to locate where they do. To introduce and explain these theories, this course covers several foundational concepts in economic geography and urban planning, such as: bid-rent theory, locational triangulation, various models of urban structure and growth, urban market areas, transportation, economic restructuring, and the ‘back-to-the-city’ movement. This course incorporates several GIS exercises to teach students the basic principles of location optimization and to help illuminate the foundational theoretical principles of economic geography.
Instructor(s): Kevin Credit Terms Offered: Autumn. Offered 2020-21
Equivalent Course(s): ENST 25910, GEOG 35900

GEOG 26100. Roots of the Modern American City. 100 Units.
This course traces the economic, social, and physical development of the city in North America from pre-European times to the mid-twentieth century. We emphasize evolving regional urban systems, the changing spatial organization of people and land use in urban areas, and the developing distinctiveness of American urban landscapes. All-day Illinois field trip required. This course is part of the College Course Cluster, Urban Design.
Instructor(s): M. Conzen Terms Offered: Autumn
Note(s): This course offered in odd years.
Equivalent Course(s): ENST 26100, HIST 38900, GEOG 36100, HIST 28900

GEOG 26500. Transportation Geography. 100 Units.
Transportation is one of the most important issues facing regions today, due in large part to a host of recent concerns - the ‘back to the city’ movement, sustainability, freight traffic, autonomous vehicles - and some older ones, like suburban sprawl and aging infrastructure. This course introduces these issues in a GIScience framework by teaching students both the theory of transportation geography and empirical methods for
analyzing transportation patterns in GIS. Methods covered include: network analysis, accessibility (walkability) analysis, spatial interaction models, and the economic analysis of transportation systems in GIS.

Instructor(s): Kevin Credit Terms Offered: Not offered 2020-21

GEOG 26510. Urban Analytics. 100 Units.
Urban analytics is a new field emerging at the intersection of urban planning practice and data science. While quantitative analytics have been used to study cities for some time, several new trends have begun to coalesce in the way that urban data is collected, analyzed, and used to make decisions: 1) increased velocity, volume, and variety in ‘big’, spatially-referenced open source datasets generated by cities, 2) the development of easily-implementable machine learning, spatial analysis, and visualization techniques to analyze these data, and 3) cities’ increasing use of new data, new technologies, and new approaches to decision-making and planning (e.g., ‘Smart Cities’). The rise of this technological-quantitative framework has also raised concerns over public participation, representation, data transparency, ‘crowd-sourcing’, and equity. In this course, we will cover contemporary urban planning issues (such as transportation planning, economic development, and land use planning) and theory. We will also investigate several cutting-edge urban analytic methodological tools, applied to questions of relevance in planning practice using ‘big’ open source datasets.

Instructor(s): Kevin Credit Terms Offered: Spring. Offered 2020-21

Equivalent Course(s): GEOG 36510

GEOG 27155. Urban Design with Nature. 100 Units.
This course will use the Chicago region as the setting to evaluate the social, environmental, and economic effects of alternative forms of human settlement. Students will examine the history, theory and practice of designing cities in sustainable ways - i.e., human settlements that are socially just, economically viable, and environmentally sound. Students will explore the literature on sustainable urban design from a variety of perspectives, and then focus on how sustainability theories play out in the Chicago region. How can Chicago’s neighborhoods be designed to promote environmental, social, and economic sustainability goals? This course is part of the College Course Cluster program: Urban Design.

Instructor(s): Sabina Shaikh and Emily Talen Terms Offered: Autumn

Prerequisite(s): Third or fourth-year standing

Note(s): Students who have taken ENST 27150: Urban Design with Nature: Assessing Social and Natural Realms in the Calumet Region in the Spring of 2018 may not enroll in this course.

Equivalent Course(s): PBPL 27156, ENST 27155, BPRO 27155

GEOG 28000. GIScience Practicum. 100 Units.
This applied course in geographic information science builds upon and refines knowledge and geocomputational expertise gained in the GIScience sequence. Students will develop multifaceted GIS project incorporating spatial thinking in design, infrastructure, and implementation. Projects could include the development of a web application, dynamic dashboard, interactive storytelling map, infographic-driven policy brief, or research article and are encouraged to link additional disciplines like health, sociology, economics, or political science.

Instructor(s): Kevin Credit Terms Offered: Spring. Offered 2020-21

Prerequisite(s): GEOG 38202; GEOG 38402

Equivalent Course(s): GEOG 38000

GEOG 28202. Geographic Information Science I. 100 Units.
This course introduces students to a wide range of geospatial technologies and techniques in order to explain the basic theory and application of geographic information systems (GIS). To do this, students will use open source or free software such as QGIS and Google Earth Pro to complete GIS lab exercises that cover a range of topics, including an introduction to different types of geospatial data, geographic measurement, GIS, principles of cartography, remote sensing, basic GIS mapping and spatial analysis techniques, remote sensing, and specific geospatial applications such as 3D modeling and geodesign. By providing a general overview of geospatial technologies, this course provides students with a broad foundational knowledge of the field of GIScience that prepares them for more specialized concepts and applications covered in future GIS courses.

Instructor(s): Kevin Credit Terms Offered: Autumn. Offered 2020-21

Equivalent Course(s): GEOG 38202

GEOG 28402. Geographic Information Science II. 100 Units.
This course investigates the theory and practice of infrastructure and computational approaches in spatial analysis and GIScience. Geocomputation is introduced as a multidisciplinary systems paradigm necessary for solving complex spatial problems and facilitating new understandings. Students will learn about the elements of spatial algorithms and data structures, geospatial topologies, spatial data queries, and the basics of geodatabase architecture and design.

Instructor(s): Marynia Kolak Terms Offered: Winter. Offered 2020-21

Prerequisite(s): GEOG 28202; GEOG 38202. Students must receive a grade of C or higher in GEOG 28202/GEOG 38202 in order to register for this course.

Equivalent Course(s): GEOG 38402, ARCH 28402

GEOG 28602. Geographic Information Science III. 100 Units.
This advanced course extends and connects both foundational and functional GIScience concepts. Students will be introduced to advanced programming and scripting languages necessary for spatial analysis and GIScience
applications. Additional topics include customization, enterprise GIS, web GIS, and advanced visualization and analytic techniques.

Instructor(s): M. Kolak
Terms Offered: Spring. Offered 2020-21

Prerequisite(s): GEOG 38202 and GEOG 38402. Students must receive a grade of C or higher in GEOG 28402/GEOG 38402 in order to register for this course.

Equivalent Course(s): ARCH 28602, GEOG 38602

GEOG 28700. Readings in Spatial Analysis. 100 Units.
This independent reading option is an opportunity to explore special topics in the exploration, visualization and statistical modeling of geospatial data.

Instructor(s): K. Credit and M. Kolak
Terms Offered: Autumn Spring Winter. Students are required to submit the College Reading and Research Course Form. Available for either quality grades or for P/F grading.

Note(s): By permission of instructor only.
Equivalent Course(s): ENST 28800, GEOG 38700

GEOG 28702. Introduction to GIS and Spatial Analysis. 100 Units.
This course provides an introduction and overview of how spatial thinking is translated into specific methods to handle geographic information and the statistical analysis of such information. This is not a course to learn a specific GIS software program, but the goal is to learn how to think about spatial aspects of research questions, as they pertain to how the data are collected, organized and transformed, and how these spatial aspects affect statistical methods. The focus is on research questions relevant in the social sciences, which inspires the selection of the particular methods that are covered. Examples include spatial data integration (spatial join), transformations between different spatial scales (overlay), the computation of ‘spatial’ variables (distance, buffer, shortest path), geovisualization, visual analytics, and the assessment of spatial autocorrelation (the lack of independence among spatial variables). The methods will be illustrated by means of open source software such as QGIS and R.

Instructor(s): M. Kolak
Terms Offered: Spring. Offered 2020-21

Equivalent Course(s): SOCI 20283, ARCH 28702, ENST 28702, SOCI 30283, GEOG 38702

GEOG 28800. History of Cartography. 100 Units.
This course offers a grand overview of the key developments in mapmaking throughout history worldwide, from pre-literate cartography to the modern interactive digital environment. It looks at the producers, their audience, the technologies and artistic systems used, and the human and global contexts in which they developed. The course also draws on the extensive map collections of Regenstein Library.

Instructor(s): Staff
Terms Offered: Spring

Equivalent Course(s): GEOG 38800

GEOG 28900. Readings in Urban Planning and Design. 100 Units.
This independent reading option is an opportunity to explore contemporary debates and theoretical arguments involved in the planning and design of cities.

Instructor(s): E. Talen
Terms Offered: Autumn Spring Winter. Students are required to submit the College Reading and Research Course Form. Available for either quality grades or for P/F grading.

Note(s): By permission of instructor only.
Equivalent Course(s): GEOG 38900, ENST 28980

GEOG 29100. Undergraduate Tutorial. 100 Units.
This course is intended for individual study of selected geographical problems.

Terms Offered: Autumn,Winter,Spring

Prerequisite(s): Consent of instructor.

Note(s): Available for either quality grades or for P/F grading.

GEOG 29700. Readings in Special Topics in Geography. 100 Units.
A program of supervised reading of a special topic in geography. Students will meet periodically with the instructor to discuss the readings, and submit a final paper critically reviewing the conceptual orientation and substantive content of the readings.

Instructor(s): M. Conzen, L. Anselin, E. Talen.
Terms Offered: Autumn Spring Winter

Prerequisite(s): Consent of instructor.

Note(s): Consent of instructor. Students are required to submit the College Reading and Research Course Form. Available for either quality grades or for P/F grading.